Education with Aerospace

Col. Chuck Whited and Dr. Joe Meltzer

Education with Aerospace (EWA) is an exciting program that assigns junior Air Force officers from SMC to work as members of the technical staff at the Aerospace Corporation. Every year, between January and March, seven to ten Lieutenants and Captains are selected to participate in this one year program that begins each April. Each officer selected locates an Aerospace project to work on and a mentor from within the Engineering or Technical Operations organizations. 1Lt Robert Bongiovi was a member of last year's EWA class.

The AFMC Engineering and Technical Management Awards selection process for 1995 has put Lt Bongiovi in the limelight. Lt. Bongiovi won the 1995 AFMC Capt Roland R. Obenland Memorial Engineering Award for his work during the EWA program. In announcing the awards, AFMC Director of Engineering, Mr. James F. Bair pointed to the "highly competitive nomination packages this year." The Obenland Award recognizes "exemplary dedication and contribution to the Air Force through advanced technology development or significant improvement through re-engineering." The following article discusses Bongiovi's award winning work.

Education with Aerospace in Technical Operations

1Lt Rob Bongiovi

IUS Integration and Operation Manager

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At Los Angeles AFB, most Lieutenants become acquainted with the Aerospace Corporation in the Program Offices. After spending a year and a half in an Integrated Product Team environment with my Aerospace counterparts, I felt I had a good idea of what the Aerospace Corporation does. Through the Education with Aerospace (EWA) program, I was able to see a part of Aerospace that I, like many SMC officers, did not know existed. My EWA project was in the Technology Operations organization, commonly know as "the labs."

During my EWA assignment, I served as the program manager for the Spatially Enhanced Broadband Array Spectrograph System (SEBASS). SEBASS is a hyperspectral infrared imaging sensor being developed by Dr. John Hackwell of the Remote Sensing Department in the Space and Environmental Center (SETC). Dr. Hackwell was my mentor in the EWA program. As program manager for the SEBASS, it was my job to coordinate and assist in the assembly, testing, characterization, operation, and maintenance of SEBASS as well as to help out with reducing and analyzing the data obtained using the instrument.

SEBASS is an advanced research sensor. It has 128 bands in the Long Wave Infrared (LWIR) spectrum (7.5 μm to 14 μm). An additional channel of 128 Medium Wave Infrared (MWIR) bands (from 1.9 μm to 5.2 μm) is currently being added. SEBASS is designed to look down from an aircraft or a tower. Its data will be used to investigate the use of hyperspectral technology to locate and identify different materials in the air or on the ground. Since SEBASS operates in the so-called "chemical fingerprint" spectral region where polyatomic molecules have strong absorption bands the sensor can tell the difference between an ozone-destroying Freon and an ozone-safe Freon or detect and quantify air pollutants such as sulfur dioxide. In addition, because materials emit infrared radiation both day and night, the sensor can identify surface materials such as paints, soils, and vegetation 24 hours per day. Although hyperspectral instruments have been built that operate in the Visible, Short Wave Infrared, and MWIR regions, there are very few operating in the LWIR region. Because of this, and the success of SEBASS over the past year, the Aerospace Corporation is one of the leaders in the field of LWIR hyperspectral sensing.

In April 1995, when I started my EWA work, assembly of SEBASS was just beginning. SEBASS had been designed and most of the parts had been ordered from outside vendors or built by the Aerospace Corporation's in-house machine shop. The summer was spent assembling SEBASS, characterizing the instrument's use of the cryogens that are used to cool the focal plane, and aligning the optics. Additionally, SEBASS requires an extremely fast data collection system. A large amount of the time required to get SEBASS working was spent creating and debugging the electronics required to collect 128 megabytes of data in 15 seconds.

In October, SEBASS was installed in a "Twin-Otter" twin-engine aircraft to participate in a hyperspectral data collection in Arizona. In two weeks of flying, SEBASS made 16 flights. Of these, only one was aborted. This is an outstanding record for an extremely complex sensor that operated for the first time two weeks before being installed in the aircraft. Following the October data collections, the 16 gigabytes of SEBASS data were reviewed and analyzed. Because SEBASS is one of the first LWIR hyperspectral instruments, the data analysis process is a learning experience for all involved and is an ongoing process.

While analyzing the flight data, SEBASS was refurbished with a new, more uniform focal plane and prepared for a second data collection. In March 1996, SEBASS collected data from a tower at White Sands Missile Range. The objective of this data collection was not to get images like those from an aircraft, but high quality hyperspectral data on specific materials located below the tower. This data can then be used to create a library of hyperspectral signatures for future use.

Currently, the MWIR channel is being added to SEBASS. Once this channel is complete, both tower and aircraft data collections are planned. These collections, along with the work performed by the SEBASS team in the past, will make the Aerospace Corporation a leader in hyperspectral technology.

As a member of the SEBASS team, I learned a tremendous amount in some very different areas. My technical work while assembling, aligning, and resolving anomalies with SEBASS gave me some of the hands-on experience that my engineering education had been missing. I spent a large amount of time working with SEBASS data, providing insight into image analysis and some related fields that I had not experienced before. Finally, I acted as the program manager, enhancing the management and leadership experience I had in my first Air Force assignment managing a different type of project.

For information about the SEBASS program, please call Dr. John Hackwell at 66041. For information about the Education with Aerospace program, the POC is Maj Jeffrey Fitzsimmons, SMC/SDES, 363-1149.